

TMS MES IN gravel mine

Description

In 2008 TMS Standard system has been introduced in key mobile equipment in all 14 mines of the mining company located in Poland.

In 2014 TMS MES (Manufacturing Execution System) has been implemented in all conveyor scales in 14 gravel mines and quarries in Poland.

TMS delivered: reporting software, system configuration and personalization, e-mail alarms system, dedicated reports individually configured for each plant and automatically sent by e-mail to mine managers and regional managers.

A key element of system customization was introduction of “Performance” reports showing OEE (*Overall Equipment Effectiveness*) and KPI (*Key Performance Indicators*) factors, as well as operational “Day View” report allowing to identify point and reason of potential production disturbances.

Each report has been individually defined for each plant.

Key features and benefits:

- Reports sent automatically on a daily basis = immediate information = comfortable usage and quick decision making = immediate corrective actions = reduction of direct production costs
- Business indicators defined in accordance with corporate standards = reduction of time and costs resulting from manual data processing
- Report templates defined on the basis of individual needs of each mine manager = matching the system to the mine requirements = friendly usage
 - Automatic calculation of business indicators; OEE (*Overall Equipment Effectiveness*)
 - Optimal use of production resources
 - Optimal efficiency of production line, each machine and machine groups.
 - Automatic calculation of Key Performance Indicators (KPI) presenting direct costs of machines and technological chains performance per ton.
 - Full control of production process efficiency
 - Time saving by giving up the manual reporting

Methodology of using dedicated reports:

Process of using dedicated reports to improve plant’s performance is continuous.

1. Daily operational procedure of using “Performance” type (OEE, KPI) reports has been defined.

2. OEE and KPI reports are used daily to improve the production process.
3. KPI reports are used daily to control direct production costs.

Operational procedure:

- Plant manager:
 - Daily verifies OEE and KPI indicators in “Performance” reports and analyses reasons of production disturbances in a “Day View” report.
 - Discusses the “Day View” report on the morning briefing.
- Regional manager:
 - Weekly develops a “Lost production” report through the TMS system.
 - Discusses this report on weekly meeting of mine managers.
 - Uses histograms and weekly tables to analyse trends.

Examples:

1. OEE report – production goals performance.

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- good use of output capacity (capacity factor) during the first shift
- worsen time usage (time usage factor)

PI Report										
Input weigher										
Date	Shift	Weigher work time	Stoppage time	Empty run time	Production t	Performance t/h	Nominal performance t/h	PrF	TU Uptime	PI productivity
August 2015		297.13	286.47	05.17	191973.10	645.9	640	100.92%	50.89%	51.36%
2015-08-21		19.42	04.18	00.16	12898.70	654.8	640	102.31%	82.08%	83.98%
	I	06:15	01:45	00:08	4148.70	653.8	640	103.72%	78.13%	81.03%
	II	06:16	01:44	00:06	4066.10	648.8	640	101.38%	78.33%	79.42%
	III	07:11	00:49	00:02	4683.90	652.1	640	101.88%	89.79%	91.48%
2015-08-22		12.35	11.25	00.10	8244.80	655.2	640	102.38%	52.43%	53.68%
	I	05:38	02:22	00:05	3736.90	663.4	640	103.65%	70.42%	72.99%
	II	06:57	01:03	00:05	4507.90	648.6	640	101.35%	86.88%	88.04%
	III	00:00	08:00	00:00	0.00	0.0	640	0.0%	0.0%	0.0%
2015-08-23		00:00	24:00	00:00	0.00	0.0	640	0.0%	0.0%	0.0%
	I	00:00	08:00	00:00	0.00	0.0	640	0.0%	0.0%	0.0%
	II	00:00	08:00	00:00	0.00	0.0	640	0.0%	0.0%	0.0%
	III	00:00	08:00	00:00	0.00	0.0	640	0.0%	0.0%	0.0%
2015-08-24		19:15	04:45	00:18	12465.20	647.5	640	101.18%	80.21%	81.15%
	I	04:52	03:08	00:05	3012.90	619.1	640	96.73%	60.83%	58.85%
	II	07:11	00:49	00:10	4697.80	654.0	640	102.19%	89.79%	91.75%
	III	07:12	00:48	00:03	4754.50	660.3	640	103.18%	90.0%	92.07%
2015-08-25		00:00	08:00	00:00	0.00	0.0	640	0.0%	0.0%	0.0%

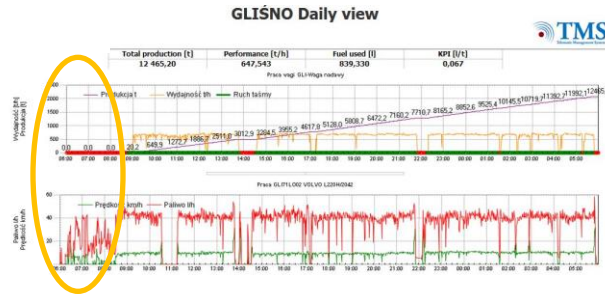
Output capacity factor – achieved capacity (t/h) / rated output capacity (t/h) * 100%

Time usage factor – measured production time/ available time * 100%

OEE (PI) – Output capacity factor * Time usage factor

2. "Day View" report – reasons of indicators deterioration

Deterioration of Time usage factor – reasons: Late work start at 9.00 a.m.



3. KPI Report – deterioration of Time usage factor in a plant results in:

- higher fuel cost per ton of production

higher mth/ kt during the first shift:

KPI Report														
Date	Shift	Time from	Time to	Production input GL1	Production GL2	Sand GL1 - GL2	Worktime GL1	Worktime GL2	Production GL1	Performance GL1 th	Fuel used - mobile machines	Ut mobile machines	Worktime - mobile machines	mth/mobile machines
August 2015				203171,00	0,00	203171	314:28	00:00	203171,00	648,08	14487,86	0,071	698:22	3,437
2015-08-21				12898,70	0,00	12898,7	19:42	00:00	12898,70*	654,8	742,30*	0,06	35:11*	2,73
	I	06:00	14:00	4148,70	0,00	4148,7	06:15	00:00	4148,70*	663,8	229,88*	0,06	13:34*	3,27
	II	14:00	22:00	4096,10	0,00	4096,1	06:16	00:00	4096,10*	648,8	238,09*	0,06	13:40*	3,40
	III	22:00	06:00	4653,90	0,00	4653,9	07:11	00:00	4653,90*	652,1	276,53*	0,06	07:48*	1,87
2015-08-22				8244,80	0,00	8244,8	12:35	09:00	8244,80*	655,2	484,60*	0,06	13:48*	1,87
	I	06:00	14:00	3736,90	0,00	3736,9	05:38	00:00	3736,90*	663,4	229,28*	0,06	06:01*	1,61
	II	14:00	22:00	4507,90	0,00	4507,9	06:57	00:00	4507,90*	648,6	255,32*	0,06	07:45*	1,72
	III	22:00	06:00	0,00	0,00	0	00:00	00:00	0,00*	0,0	0,00*	0,00	00:00*	0,00
2015-08-23				0,00	0,00	0	00:00	00:00	0,00*	0,0	0,00*	0,00	00:00*	0,00
	I	06:00	14:00	0,00	0,00	0	00:00	00:00	0,00*	0,0	0,00*	0,00	00:00*	0,00
	II	14:00	22:00	0,00	0,00	0	00:00	00:00	0,00*	0,0	0,00*	0,00	00:00*	0,00
	III	22:00	06:00	0,00	0,00	0	00:00	00:00	0,00*	0,0	0,00*	0,00	00:00*	0,00
2015-08-24				12465,20	0,00	12465,2	19:15	09:00	12465,20*	647,5	839,33*	0,07	37:01*	2,7
	I	06:00	14:00	3012,90	0,00	3012,9	04:52	00:00	3012,90*	619,1	239,88*	0,08	14:06*	4,68
	II	14:00	22:00	4697,80	0,00	4697,8	07:11	00:00	4697,80*	654,0	297,88*	0,06	14:56*	3,19
	III	22:00	06:00	4754,50	0,00	4754,5	07:12	00:00	4754,50*	660,3	306,22*	0,06	07:59*	1,4
2015-08-25				11197,90	0,00	11197,9	17:15	09:00	11197,90*	649,2	799,27*	0,07	37:01*	3,11
	I	06:00	14:00	1877,30	0,00	1877,3	02:58	00:00	1877,30*	632,8	219,06*	0,12	15:14*	8,11
	II	14:00	22:00	4371,90	0,00	4371,9	06:56	00:00	4371,90*	630,6	289,90*	0,07	13:59*	3,20
	III	22:00	06:00	4948,70	0,00	4948,7	07:21	00:00	4948,70*	673,3	290,31*	0,06	07:50*	1,58